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15 cm. and a radius of curvature of 15 M. This is the arrangement now being used. With this velocity, assuming a band can be read to one thirtieth part, a distance of only .3 cm. would show a velocity. The rays during transit may be made to pass within a tube which can be evacuated, connecting  $M$  and  $M'$ . Another arrangement may be used when  $M$  is placed at a much greater distance and is shown in the annexed diagram.  $I$  and  $I'$  are two lenses whose foci are  $M$  and their conjugate foci on each face of  $M'$  respectively.

It seems certain now that the wave-velocity in different media, as well as in vacuo, may be determined to a high degree of accuracy and that too for any color.

UNIVERSITY OF NEBRASKA. D. B. BRACE.

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*PREHISTORIC PORTO RICO.\**

It has been customary for the Vice-President of this Section of the Association to present in his retiring address certain general conclusions to which he has been led by his own special studies or those of his contemporaries. But it has not been regarded as out of place for him to outline new and promising fields of research or to indicate lines for future development of our science.

Late historical events have brought into our horizon new fields for conquest and opened new vistas for anthropological study. In the last years the political boundaries of the United States have been so enlarged that we have come to be regarded a 'world power,' and with this growth new colonies beyond the seas now form parts of our domain. With this new epoch certain broad scientific questions have come to present a special claim on our students, and we have been brought

\* Address by the Vice-President and Chairman of Section H, for 1901, at the Pittsburgh meeting of the American Association for the Advancement of Science.

closer than ever before to problems concerning other races of man besides the North American Indian. Great fields of work attract our ethnologists to the far East and the islands of the Pacific, and these new problems will occupy our attention with ever-increasing interest in years to come as anthropology advances to its destined place among sister sciences. It is natural and eminently fitting that attention at this time should be directed to some of the new anthropological problems before us, and I have chosen as a subject of my address, 'Prehistoric Porto Rico,' and the Antillean race which reached its highest development in our new possession in the West Indies.

Among all the acquisitions which came to the United States by the Treaty of Paris, Porto Rico is preeminent from an anthropological point of view. Fourth in size of the Antilles, it is the most centrally placed of a chain of islands reaching from Florida to the coast of South America. Before the coming of Columbus there had developed in these islands a culture sufficiently self centered to be characteristic, and our new possession was the focus of that culture. Here was found a race living in an insular environment exceptional on the Western Hemisphere. If as the great anthrogeographers insist anthropological problems are simply geographical in their final analysis, where can we find a better opportunity to trace the intimate relationship of man's culture and his surroundings? Where was there on the American continent at the time of its discovery a people less affected by contact with other cultures or more truly the reflection of climatic conditions?

It may be truly said that important questions regarding migrations of the early inhabitants of the American continent are intimately related to the cultural character of the prehistoric race which

peopled the West Indies. Was this race derived from the great northern or southern land masses or was it an offspring from the early inhabitants of Yucatan, the great peninsula of Mexico which projects towards the end of Cuba? Many theories of the peopling of these islands have been propounded, but none is regarded with full confidence. Although this race was the first seen by Europeans, by whom it has been known for the longest time, comparatively little accurate study has been given to it by the anthropologist. Documentary evidences are not meager, but ethnological data are limited, for the race disappeared within a few generations after its discovery and lost much of its distinctive characteristics by mixture with other peoples. Archeology furnishes more material bearing on the problem than ethnology, but this material has not been correlated, being widely scattered in different museums in Europe and America, and in collections which remain in private hands. A great amount of archeological data yet remains hidden in the soil awaiting the spade of the explorer.

Although English scientific literature on the archeology of Porto Rico is remarkably limited, the study has attracted several anthropologists whose works are of highest importance. It has been zealously cultivated by several native Porto Ricans whose publications, in Spanish, are little known to students in the United States, since some of the most important of these contributions have appeared in local newspapers of the island having no foreign circulation. The main sources for the more important historical works of modern historians are standard writers like Oviedo, Herrera, Muñoz, Las Casas, and Iñigo with notes by J. J. Acosta, and rich unpublished documentary material by Tapia y Rivera. The more prominent modern Porto

Rican historians are Salvador Brau and Coll y Toste, who deal more especially with historical epochs, while the writings of Padre Nazario, Neuman, Gandia and Torres, many of which are controversial, are important aids in the same lines of research.

No institutions have exerted a more stimulating influence on the local study of Porto Rican history than that of the 'Sociedad Económica de Amigos del País,' and the Ateneo Puertorriqueño of San Juan. The former, founded by enthusiastic students in Europe, no longer exists, but the latter has a fine library on the plaza Alfonso XIII. where there are a number of portraits of famous Porto Ricans.

A most valuable scientific publication, on the Indians of Porto Rico, and the only modern Spanish work which follows archeological methods is by Dr. A. Stahl, a native of the island, educated in Germany, who has made many important contributions to the study of the flora and fauna of the island. This work, 'Los Indios Borinqueños' appeared in 1889 and while criticised in unessential points has held its place as a work of highest merit.

Professor Mason's catalogue of the Latimer and Guersde collections are the most important archeological works which have yet been published on the antiquities of the Antilles. There are many scattered references in the writings of Stevens, Dr. Cronau and other authors which augment this information and practically complete the all too meager literature of a great subject.

It would be impossible for me in this brief address to do more than outline in a general way the prehistoric culture of Porto Rico. I have in preparation a more extended account in which I have drawn largely from sources above mentioned, from an examination of many archeological specimens in private collec-

tions unknown to science, and a personal study of the island on a short reconnoissance in April and May of the present year.

Ethnology affords us but scanty data for the study of the subject, as the aborigines have been so changed by intermarriage with other races that little can be identified as belonging to the precolumbian life of the island. Still in the more isolated regions the Indian features can be recognized and certain customs peculiar to the island can be traced to Indian parentage.

There are many Boriquen words in the patois of the mountainous region, and the rugged valleys of Loquillo, the Sierras on the eastern end of the island, called Yunque and Cacique mountains, still have a wealth of folklore, part Spanish, part Indian, with a mixture of African, which will reveal to the folklorist many instructive phases of this subject. Mr. Spinosa has already published some of these tales in a short popular account, but much in this line yet remains to be done in this isolated, perhaps the most inaccessible region of the island. Many of the mountains in this locality are regarded as enchanted and about them cluster stories of St. John, the patron of the island, mixed with legends of old Indian caciques and their families.

In his note on the name of the mountain Yunque, Acosta, quoting from a documentary account of Porto Rico by Presbiter Ponce de Leon and Bachillar Antonio de Santa Clara, written in 1582 by order of the King, derives the word Loquillo from the name of a cacique who lived in this high Sierra but was never conquered. According to Acosta this tradition of the last surviving cacique of the island has furnished a subject to Sr. Tapia y Rivera for his novel entitled 'El Ultimo Borinquencaño.'

All the available evidence supports the

conclusion that we must look in the inaccessible region of Porto Rico called Loquillo for the purest Indian blood among the present mountaineers of the island. In the isolated valleys of this region we still find the old Carib canoe surviving in the hollowed-out log of wood by which produce is drawn down the slippery mountain sides. Here are also the old forms of hammocks different from those now generally used. Maize is a staple article of food and the primitive mills with which it is ground date back to a remote past.

The prehistoric inhabitants of the Antilles from the Bahamas to the coast of South America belonged to one and the same composite stock differing in minor characteristics which are not racial. The people of the Bahamas, Cuba, Hayti and Porto Rico are a mild agricultural race which had lost in vigor what they had gained by their sedentary life. The Caribs confined to the Lesser Antilles were more warlike and their ferocity was known everywhere in the West Indies. Columbus heard of them on his first voyage when he landed on the Bahamas, and on his second voyage his first landfall was on one of the islands where they lived. Although he saw little of the Caribs on this voyage, he learned of Boriquen or modern Porto Rico from some of the captive women, and taking these slaves on board his ship, he coasted along its southern shore, at last landing on the western end, near Aguadilla, filling his water casks at the famous spring at that place.

Although a well-known local historian has questioned this as the landing place of Columbus in Boriquen, the evidence supports tradition and a beautiful monument very properly marks the place where the great Admiral landed in 1493. But while the majority of writers ascribes the discovery of Boriquen to Co-

lumbus, on his second voyage, Sr. Luis Llorens Torres gives the honor to another and, in a well-written pamphlet on 'America,' has shown in a convincing way that when Martin Alonzo Pinzon separated from the great Admiral, on his first voyage, he visited Porto Rico, and probably landed on its shores.

Dr. D. Isaac Gonzales Mestizes, as quoted by Sr. Torres, states very clearly the arguments for the unity of the prehistoric people of the West Indies, and shows that the insular Caribs and Boriqueños were practically of the same stock, although they differed somewhat in their mode of life, due to climatic influences, their religion, customs and languages.

The former although confined to the Smaller Antilles made frequent predatory expeditions upon the more peaceable inhabitants of Cuba, Hayti and Porto Rico, especially the latter, carrying away the women as slaves. Thus we have in the insular Carib communities men and women speaking different dialects, showing idiomatic differences in the Carib and Boriquen speech and implying amalgamation of the two stocks. The incursions of the Caribs on the eastern coast of Porto Rico continued after the Spanish had made settlements there and they raided and destroyed the town Naguabo on the river of the same name.

Unfortunately we have no authentic cranium of a typical prehistoric Porto Rican to compare with that of the Caribs, although it is probable that skulls of this race could be found in a systematic scientific exploration of the island, especially in caves in the neighborhood of Utuado Ciales and the more inaccessible parts of the island. The name of a cave, Cueo del Muertos, not far from Utuado indicates that it was used for burial or deposition of the dead. These caves contain many re-

ligious symbols, as rock etchings of gods and grotesque forms of idols cut out of stalactites, showing that they were used by the Indians as places of worship, refuge, or possibly for burial of the dead.

When Columbus landed on the island of Guanahani the first native words he heard belonged to a language which was one of the most widely distributed of those of the new world, a tongue which, with dialectic variations, was the speech from central South America to the coast of Florida. These dialectic differences in the speech of the Antilles aborigines were small, the Caribs of the Lesser West Indies and the Lucayans of the Bahamas being linguistically of the same stock, as has been repeatedly pointed out by several writers, ancient and modern. This same stock had left traces of its language and peculiar culture on the Spanish main along the coast of Mexico, which facts are significant but have led to erroneous views of the relationship of the aborigines of Central America, Cuba, Hayti and Porto Rico.

The accounts of the houses of the prehistoric Porto Ricans by Oviedo, Iñigo and others are amply sufficient to lead us to conclude that they did not greatly differ from those of the country people to-day. Stone or adobe buildings were not constructed, but a fragile cabin the frame of which was tied together with maguey fiber and covered with bark of the royal palm or yucca and thatched with straw furnished a home for the prehistoric Portoriqueños. These houses, like their modern representatives, were raised on posts to avoid dampness and insects, suggesting pile-dwellings—a feature of house-construction with which the Caribs were familiar.

In many of the smaller towns of Porto Rico we still find a street lined with these houses built in the same primitive way,

inhabited by poorer people, negroes or peons. Some of these modern buildings are of the rudest construction and practically the same as those which Oviedo described, in Hayti, four centuries ago.

It appears from early records that, at the time of Columbus's first visit, the Indians lived in cabins scattered over the island, but that here and there these primitive dwellings were collected in pueblos. The pueblo of the Cacique Guaybana was described by Muñoz in some detail. It was situated back from the shore and consisted of a circle of these cabins surrounding the central houses of the cacique. Two parallel rows of palisades forming an arbor united this pueblo with a lookout on the beach, built somewhat higher as a place of observation. It is probable that the plaza enclosed by the ring of houses was the dance place, and that the central houses of the cacique contained the clan idol and other objects used in the cult of the inhabitants.

Similar villages are reported as existing in Cuba and Hayti, and it was probably into one of these that the embassy of Columbus to the Great Khan was conducted, when they penetrated into the interior of the former island. On their return to the squadron this embassy reported to the Admiral that they were escorted to a special house, probably that of the cacique, seated on a wooden chair (evidently a *duho* such as we now find in several collections) made in imitation of an animal and surrounded by natives who also had their appropriate seats. The accounts clearly indicate that the Spaniards were regarded as supernatural beings, carried to the god house of the pueblo, and seated on the chair of the gods.

The furniture of the house of the ancient Porto Rican was limited but ample. The bed was a hammock made of the leaves of

the palm, maguey or fiber of native cotton. In the mountainous regions of El Yunque primitive hammocks, like those of the ancients, are still made and the palm fiber is wholly employed in their construction. Calabashes or cocoanuts served for household implements as drinking cups, and in the poorer parts of the island are still used for the same purpose. We have every reason to suppose that these objects were ornamented with incised geometrical figures, but whether the patterns now used in the adornment of these objects have been inherited from a Carib ancestry is yet to be satisfactorily made out.

Clay vessels of rude construction were used by these Porto Rican Caribs who lived along the shore. Multitudes of fragments of these objects are found to-day in several localities, one of the best of which is the country about Cabo Rejo. These clay vessels are, as a rule, of rude construction, unglazed, their rims commonly adorned with raised heads representing animals of grotesque forms. The likeness of many of these heads to monkeys has led several writers to ascribe this pottery to races living on islands or the mainland inhabited by simian genera. There are no monkeys in Porto Rico where these heads are found and, as the clay objects are most abundant along the shore, they are generally ascribed to the Caribs. I have examined several unbroken clay vessels from the island which are undoubtedly of Carib manufacture, all of which were ornamented in relief or intaglio, and regard this supposed resemblance to monkeys' heads as highly fanciful.

According to the early writers the men and girls had little clothing, but the married women and caciques wore a woven cloth of palm fiber called *nagua*, which apparently resembled the breech cloth with dependent ends. In the warm climate

clothing was not needed for warmth and a liberal covering of paint protected their bodies from the heat of the tropical sun and the bites of troublesome insects.

The most characteristic of all objects made by the Caribs were the canoes, with which they navigated from island to island or traveled along the numerous rivers and lagoons. These craft often reached a great size and were in some instances made of logs of wood hollowed out with stone tools aided by fire. If there is one feature which more than others distinguishes this Antillean culture it is the development of their maritime habits, of which these canoes are the objective expression, but this characteristic was highly developed before the race landed on the islands. Canoe building had reached a considerable development in their primitive original homes, and made it possible for the tribes to migrate to the islands.

The number of stone implements in collections from Porto Rico is very large, including objects of all sizes and many shapes. The arms of warfare were mostly adzes and hatchets with wooden handles, war-clubs made of ironwood of the island, spears and possibly throwing-sticks. In the collections which were examined, no arrow points were found. As a rule the implements from the Antilles are polished stone, but I have seen two celts which show marks of chipping. Most of these implements were of stone, but Mr. Yunghannis, of Bayamon, has in his collection a celt from Porto Rico made from the lip of a conch shell like those used by the Caribs of the Lesser Antilles.

The height of culture attained by the prehistoric inhabitants of Porto Rico, as shown by their pictography, has been variously interpreted, but, so far as known, the writing of this people was of the rudest kind, consisting of pictures having the same general character as the pictography

of the North American Indians. Specimens of this work are found on the flat slabs of stone used in the enclosed dance plazas or on isolated bowlders. The soft, easily eroded rock of the island does not retain this paleography for any considerable length of time, especially when exposed to the weather.

In the caves on the island there still remain many excellent specimens of picture writing, some of the best of which are studied near Ciales and Aquas Buenas in the high mountains of the central region of the island. Some of the caves are of great beauty, among the most interesting of the many natural attractions of Porto Rico. They were resorted to by the Indians for religious purposes and later for refuge, but there is no reason to suppose that they were ever extensively peopled, for the ancient Porto Ricans lived in the open and were not trogloditic.

An article published by Mr. Krüg contains all that has yet appeared in print on Boriquen pictography, which will be more fully illustrated in my report on a reconnaissance of the island during the last spring. The figures which were studied appear to be clan totem and other symbols.

From the accounts which have been preserved there is every probability that the social organization of the inhabitants of prehistoric Porto Rico was practically the same as that of the Indians of other parts of America. The unit of organization was the clan, the chief of which was called a cacique.

It would appear that certain of these caciques had control over others, governing large sections of the island, and that a union of several smaller caciques for mutual defense occurred at rare intervals. As a rule there was no such union, caciques of neighboring valleys were not friendly, often hostile, making raids on each other.

In certain sections of the island a Carib chief appears to have raised himself to the position of governor of this region. In every settlement the cacique and his immediate relations occupied a house larger than the others and centrally placed, containing the penates of the clan. The power of the head clan man was supreme, his wives, of which there were many, were practically slaves and descent was apparently in the male line. The cacique had several insignia of his rank, among which may be mentioned bodily decoration, a gold plate, called a *guardim*, worn on his breast, and a stone amulet (beautiful specimens of which are now preserved in several collections) tied to his forehead.

The names of many of these caciques are still preserved on the island, and it would appear that localities, mountains and rivers, were so called after powerful rulers. Thus we have Arecibo, the modern name of a beautiful city on the north coast, in the district of the chief, Areziba, Mayagoex gave his name to Mayaguez, and many other examples which might be mentioned. It is probable, as shown by Dr. Stahl, that the names of minor caciques, possibly clan chiefs, are perpetuated in names of the modern towns Utuado, Yubucoa, Gurabo, Cayey, Camuy and many others. Aguenaba is commonly stated to have been the sovereign ruler of all the island, but his power was certainly not always recognized, and it would be exceptional in Carib society to find one man an absolute ruler of the island of the size of Porto Rico.

Among supposed insignia of caciques should be mentioned characteristic stone ring form, which from their form have been called 'collars.' These are often made of the hardest stone, beautifully polished and decorated, showing evidence of having been ornamented with inlaid

gold or precious stones. The interpretation of these objects is one of the archeological enigmas, for the early historians are silent regarding their use or what they represent. The consensus of modern opinion is that they were bandoliers worn by the caciques as insignia of rank, and the form of many favors this conclusion. Others are too small and many too heavy to be carried either about the neck or on the shoulders as a kind of bandolier, which facts throw some doubt on the theory that these objects were ever worn on the person. The older writers are also silent regarding the meaning of the elaborate designs which are cut upon them. A study of these designs on many specimens shows that, in some instances, they correspond to the head and parts of the body of certain stone idols, and there is every probability that these designs represent forms of clan gods. Acosta, in a valuable note to the last edition of Fray Iñigo's history of Porto Rico, refers to his examination of many specimens of these collars and suggests that these rings represent the bodies of serpents upon which stone heads were fitted, the whole representing a coiled serpent.

This is not the place to present all the evidence I have gathered to support this suggestion, but it may be said that in one of the so-called collars which was examined on my recent visit to the island the resemblance to a coiled serpent was so close that its identity was perfect, even the head being well represented.

It may be urged, since snakes are so rare and small in Porto Rico, that the natives would not elevate a cultus of them to the height these stones imply. But it may be said that stone collars of this kind are not confined to this island, occurring also where serpents are large and deadly. Moreover, the old accounts say

the Antilleans had images of snakes and these are the only objects of serpentine form known to collectors. Although it is probable that these problematical collars were sometimes worn as insignia, there are many others where this use would be impossible.

Among the best polished stone images found in collections from Porto Rico are small figures, called amulets, representing frogs, turtles, lizards, birds and other animals. These nicely worked specimens are commonly concave or slightly curved on one side, being tied in position by means of a cord passing through a hole drilled from edge to edge. Some of the writers of the sixteenth century mention the fact that the Antilleans wore stone images on their foreheads, to indicate the clan.

As in all primitive society the social organization of the Antilleans was built on a religious foundation, the people being governed by priesthoods which controlled all the public life of the people. Every cacique was a priest in virtue of his standing in the clan, which was the political unit and, as we shall later see, the religious and ceremonial unit as well. The whole social and religious organization was knit together by a form of totemism or tutelary clan ancients worship which I shall call zemeism.

These priests were called Boii or sorcerers, and their idols apparently often had the same name as the priesthood. In their ceremonies these priests represented ancestors symbolically, and naturally took the names of that which they represented.

The functions of these priests were much the same as those of the priesthood in all primitive society. They performed rites and ceremonies connected with the worship of ancestral gods, located diseases and bodily ills by magical methods and practised an elaborate system of divination,

which is described with more or less detail in the several early accounts. Disguised as a god or hidden behind or near a statue of the same, these priests gave oracular responses to those consulting them, making use of elaborate mechanism to deceive those who consulted the idols as oracles.

One of the most remarkable of these prophecies mentioned by Gomara in the middle of the sixteenth century has become historic. The father of the cacique, Guarionix, who ruled one of the five great Cacicquedoms of Hayti, consulted the zemi regarding the fate of his gods and people, having prepared himself by fasting and purifications as the customs of his country required. He received this reply: Before many years there would come to the island bearded men with bodies clothed in mail, who with one stroke of the sword would sever men in twain, would bring fire over the land and drive from the earth the ancestral gods, destroying time-honored rites, and make blood flow like water. Gomera comments on this prophecy in his quaint way, adding that all these evils have followed in the wake of the advent of the Spaniards.

In a famous letter in which he describes his first voyage to America Columbus stated that the natives of Hispaniola or Hayti were without any religion, but on a later sojourn in their midst he was able to form more accurate ideas of their manners and customs and correct his earlier impressions. He found that, instead of being destitute of this universal human attribute, they recognized and worshipped many supernatural beings, which they represented by idols to which they gave the name zemis. Columbus discovered that they had special houses called temples set aside for this purpose in which these rude idols were set up, and that this cult was practiced by fraternities of priests who

exercised the healing art and consulted idols for oracular purposes. The idea of a future life was found to be universal among the inhabitants of the island. In a work ascribed to the Admiral's son, Fernando, the author sets forth more in detail the general character of this religion which his father found in the Antilles, and contemporary writers have supplemented it with an account of the exoteric character of the cultus of the natives of Cuba, Hayti and Porto Rico.

It is but natural that some of these writers, and those of the two centuries following that in which America was discovered, should have formed erroneous impressions of the nature of this cultus. Recognizing a well-developed idolatry, they sought and found in it, to their satisfaction, a god of good and one of evil, or two supreme deities, analogues of the Christian God and Devil. There could be no more erroneous and misleading explanation of the meaning of zemeism than this, and the error is apparent when we review subsequent historical interpretations in the light of modern ethnology. The misinterpretation threw discredit on all that had been written, most of which was strictly accurate so far as statement of facts was concerned, for while the Antilleans may not have had the ethical gods imputed to them by early writers, we need not deny them the possession of a religious sentiment, or agree with the conclusions of a prominent Porto Rican ethnologist that everything points to the belief that the Boriquen Indians were wholly destitute of religious ideas. There are to my mind many and conclusive archaeological proofs which practically support what Columbus, Oviedo, Herrera and others state regarding the religion of the Antillean, although I am unable to accept the interpretation of its nature advanced by them.

In order to determine the nature of the Porto Rican aboriginal cultus, let us examine the writings of those who saw or knew of it first hand and have recorded their observations, and the available archaeological material, a great amount of which has come down to our time in the shape of idols and religious paraphernalia.

It will be evident to any one who reads the early accounts of these images that the same names are applied indiscriminately to the idol and the spirit or magic power it represents, indicating that one personates or symbolizes the other.

Fray Roman Pane says that the Haytian caciques had certain stones called zemis which they religiously preserve; that each of these has a peculiar virtue; thus one can make grain sprout, another aids women to be delivered without pain, and the third is efficacious in bringing rain.

I shall later be able to give you some idea of the shape of some of these zemis from available archeological material, but it is sufficient at this point to note that magic powers were ascribed to certain stones. Stone zemis are the most numerous in all collections from the Antilles. But this was not the only material out of which these zemis were formed, for according to Oviedo and other writers various accounts have come down to us recording the forms of these images. They are said to represent various bizarre animals, frogs, turtles, snakes, lizards and birds. They had many specific names, and according to Fernando Columbus each clan chief had his own tutelary zemi with a characteristic name, and Gomarra in 1553 adds that they were named water, corn, safety and victory. Several Spanish writers state that both sun and moon were regarded as zemis by the people of Hayti, and according to Charlevoix these luminaries were supposed to have originated from a cave near Cape François

in the northern part of the island, where there were two large idols representing the sun and moon, and a pictograph evidently of the sun, and niches for the reception of minor idols.

It is an instructive and suggestive fact that the human race was believed to have emerged from the same cave, and on their advent upon the earth's surface men had the forms of various animals. The strange parallelism between this belief of the Antillean and that of the aborigines of the continent of America can be readily explained by a common theory, for in both cases these animals were clan totems.

The next aspect of the cult of the zemis, as derived from historical sources, is also significant in attempts at interpretation. Several of the older authors speak of the custom among the Antilleans of painting their bodies and faces, affirming that the cacique painted a figure of his zemi on his body, following in other words an almost universal custom among primitive man of decorating himself with his totem. There is good evidence that the totem as used by North American tribes was primarily a man's name and mark, and that etymologically the word refers to the pigment or earth used in painting a distinctive mark on the body. A strict abhorrence of incest and the necessity of bodily marks to distinguish members of the same clan naturally led to designs on the body which took the form of animals and plants or other natural objects. From their simple method of designating member clans by bodily markings so that a man could recognize his relatives has sprung a system of theoretical totemism which has been exaggerated by many well-known writers. Primarily the zemi which the Antillean painted on his body corresponds with the totem of the North American and

zemeism is practically another name for totemism, a form of ancestor worship.

Certain statements of some of the older writers can be quoted to show that the Antilleans derived the clan from the zemi by descent. Herrera speaks of zemis named from ancestors, a statement Tejada in his valuable history of San Domingo repeats with addition. These supernatural beings personated by images of stone, clay and wood, or represented in paint on the bodies of the cacique, are said to be ancestral, or representations of the clan ancients pointing to the belief that zemeism was a form of ancients or ancestor worship, the individual zemis being tutelary clan ancients.

Other indirect evidence of ancestor worship can be found in the description given by early writers of certain objects found in the West Indies.

The sight of human skulls and bones in Carib houses, taken in connection with the stories of cannibalism with which the minds of the early discoverers were filled, naturally led to the belief that the Caribs were anthropophagous and the name Carib subsequently passed into literature as a synonym of cannibal.

It appears that the skulls of the defunct were preserved and kept in the houses, and it is probable that the sight of these heads led to the distorted accounts of cannibalism among the Caribs, which were found in the writings of the sixteenth century and copied with gruesome embellishments by later authors. The preservation of the skulls or other parts of the body of their ancestors is simply an aspect of ancestor worship which runs through the zemi cultus and is all-important in the religious ideas of all the Antillean aborigines. Although these preserved skulls were once so numerous, so far as I know only one specimen of human skull and body preserved as an object of worship has found

its way into the hands of the collector. This object taken from a cave near Maniel, west of the city of Santo Domingo, was figured in my article on zemis from Santo Domingo, and again in Dr. Cronan's history of the discovery of America. The body, made of woven fabrics with arms akimbo, is in a sitting posture, while the head is covered with cotton fabric, with artificial eyes inserted in the sockets of the skull. This specimen, one of the most instructive of all objects illustrating the Antillean cultus, was undoubtedly revered and regarded as an object of worship.

It is instructive in view of the ancestor worship which this specimen indicates to refer to certain mortuary customs of the prehistoric Antilleans as recorded by Oviedo. After describing the custom of wife burial with the dead, he says that in the interment of certain caciques the natives envelop the body in cotton cloth, place it in a grave which they cover with boughs and sticks, depositing with the dead the objects he prized most highly. The corpse was placed in the grave in a sitting posture on a seat called a *duho*, and for many days after burial areitos or ceremonial dances were held in its honor, in which the virtues of the deceased and his many good deeds in peace or war were extolled. No reference is made to the subsequent fate of the skeleton, but it is more than likely that it was later removed from its grave, which may account for the failure of archeologists to find the ancient Antillean sepultures.

The archeological material available for the study of the Antillean cultus is more complete than the historical, for there are several large collections in which many of these objects made of stone and wood are found in different museums in Europe and America, and still remain on the islands of Porto Rico and Santo Domingo, where

there are several private collections of great value. The Latimer collection in the Smithsonian and the Stahl collection in the American Museum of New York are the largest in the United States, while the Newman and Nazario collections on the island of Porto Rico are of great size.

A typical form of Porto Rican stone idol has a conical elevation, to which Mason has given the suggestive name 'mammiform figures.' The general character of these stones and the various bizarre animal heads which they represent answer all the documentary descriptions of zemis, and the fact that a similar object figured by Charlevoix with the legend 'zemi' proves their identity. This identification has been questioned in some quarters because in the majority of specimens the lower surface is concave, suggesting that they were used as paint mortars, but in a collection which I have examined at Bayamon this surface is convex and ornamented with incised lines, making it impossible for them to be used as mortars or for grinding purposes.

We find these zemis differing very greatly in size, in the kind of rock of which they were made, and the artistic finish. It is probable that they were once decorated with gold eyes and ear ornaments, which additions have, however, long ago disappeared. They represent frogs, birds, reptiles and various other animals with bizarre shapes, or are carved to represent grotesque human faces with body and limbs, as a rule, very reduced in size.

The most problematical structure of the mammiform zemi is a conical projection which most of them bear on their backs. It has suggested to Mason a symbol of the characteristic mountains of Porto Rico and other West Indian islands, the whole stone figure representing the genius of Boriquen, or a myth analogous to the story of Typhoeus.

It is interesting to note that El Yunque, the highest peak of the island, when seen from the little coast town, Loquillo, has an appearance that suggests a conical zemi, with a central conical elevation and a lateral elevation on each side.

Thus far no zemis made of wood have been described from Porto Rico, but several from Hayti and the other Antilles, have been found in special niches in the walls of caves seated on god chairs, as several authors have described. In a report on my late visit to the Antilles I shall describe and figure one of the most perfect of these wooden zemis which has yet been recorded.

From what has been already given regarding the character of the zemis, as deduced from historical and archeological sources, it is possible to state in résumé the following conclusion regarding the nature of the worship which they illustrate. Roughly speaking, Antillean worship was a form of cultus called zemeism or ancestor worship, the zemi representing the clan ancient or tutelary god of the clan. These clan gods in stone and wood represented the ancestors of the clan, and were supposed to have, by virtue of their forms, the magic power of the ancestor.

The figures painted on the bodies of the caciques represent the clan tutelary beings, each different and characteristic as the clan differed. There is little doubt that when a cacique was thus painted with the figure of his tutelary in his own conception, as well as in that of his clan, he became that supernatural to all intents and purposes, just as when a Pueblo Indian puts on a mask with certain symbols he is transformed into the being which the symbolism of that mask represents.

Not only did each cacique or clan preserve as an object of worship, an idol representing his tutelary clan parent or zemi, but also his bodily decorations in certain

dances and at other times represented that ancestor. In this occult or esoteric way he became a living personator of the ancestors worshiped by the clan of which he was chief. The painting of the body among the Antilleans appears to have taken the place of elaborate masks so common in North America, a practical expedient which the hot climate dictated.

But the Antilleans were likewise familiar with the use of masks in personations of their gods, and while these objects are not directly described as worn in their many ceremonial dances, there can hardly be a doubt that Dr. Chanca had this usage in mind when he wrote certain passages of his famous letter. That the Antilleans had masks of ceremonial import, not only references to them in the early Spanish writers show, but also wooden and stone masks existing in different collections demonstrate. Some of these, as one in the Capitol at Hayti, are of a size to fit the face, others are too small and too heavy to be worn, so that the probability is that most of these masks had become highly conventionalized in their use. They were not worn, but still functioned for the same purpose as if they were. They represented symbolically the clan zemi, but face and bodily decoration made their use as face coverings redundant. There is every probability that they were carried in the hands or attached to rods or other objects by those personating the ancients.

In strict accord with this interpretation of the symbolic masks of stone and wood are the repeated statements in the early chronicles that they were offered as gifts to those whom the giver thought to be supernatural, an act symbolizing the fealty of the clan god or zemi to a higher god. This is paralleled with modifications elsewhere in primitive American religions. Montezuma, believing Cortez a god, possibly Quetzalcoatl, sent him a bird snake mask of

wondrous workmanship. So also the early accounts say that on several occasions the Indians of the Antilles, as symbols of friendship or fealty, sent masks to Columbus. One of these, given by the Cacique Guacanagaei to Columbus on his visit to Hayti, is said to have been made of wood with tongue, eyes and nose of massive gold. This object no doubt resembled those of stone in the Latimer collection of the Smithsonian. Columbus saw many of these masks in Cuba on his first voyage, and on his return to the ill-starred colony of Navidad, on his second voyage, was met by an embassy of the same cacique bearing two masks with gold ornaments as regalia. These masks no doubt in both cases were symbolic of the supernatural power of the tutelary god of the cacique. The act of sending them was one of homage and respect of himself, his clan and the being worshiped. It is also instructive to note, as an evidence of a widespread custom among American aborigines, that with one of these symbolic masks Columbus also received as a present a belt ornamented with shells, stones and bones recalling, as Dr. Cronan has pointed out, the wampum of North American Indians.

The worship of ancestors which comes out so plainly in all proper interpretations of zemeism, appears likewise in the care of the dead and the whole nature of mortuary customs of both insular Caribs and Oronoco Guaraunos. From the existence of many skulls in the houses of the former it has been supposed that these people were anthropophagous, but it is probable, as has been shown above, that many of these skulls, carefully wrapped in basket ware or woven cotton coverings, were the crania of their own ancestors, preserved with pious care and used in the rites and ceremonies of ancestor worship. These skulls, artificially covered with cotton fabrics and attached to

bodies of the same material, were seated on stone god chairs or *duhos*, and deposited in caves, but they were also kept in houses as the early records state.

We find in the descriptions of the Antilleans accounts of exercises called areitos which I have interpreted as ceremonial dances in which ancestors were personated. The short descriptions which have come down to us indicate, as a rule, that these dances had a religious motive in which the praise of the ancestors was only one, although a most important part. Great stress is laid by most writers on the fact that in these dances songs commemorating deeds of valor or personal worth of the dead were sung, and all agree that they occurred on all ceremonial occasions. The areito was undoubtedly a ceremonial drama, composed of rites public and secret, and accompanied semi-religious games, dances and various other elements. In these areitos the priests personated their ancestors, as do the Pueblos in their Katcinas, but with far different paraphernalia.

Although there is material available in documentary history for that purpose it would take me too long to describe the ceremonies of the prehistoric Antilleans, one of typical character which may be identified, a ceremony to the goddess of growth, which was one of the best known ceremonies of the prehistoric Antilleans, having been described by Gomara, Herrera, Haklyt, Tejada, Charlevoix and others. The latter gives a picture, somewhat fanciful, of the dance accompanying this ceremony, which is copied by Picard on his great work on the rites and ceremonies of all people.

The occurrence of this ceremony was announced publicly by a town crier directed by the cacique and consisted of a procession to the temple or house in which the image of the Earth Mother was

placed. The cacique led the line of dancers, and, when he had approached the entrance to the temple, seated himself near the idol, vigorously beating a drum to the sound of which the participants danced. The procession was composed of men, girls and women. The men had their bodies painted black, red, green and other colors and wore many ornaments of shell, and feathers in their heads. The girls and women bore baskets of cakes ornamented with flowers.

As the members of the procession approached the idol of the growth goddess they raised the flowers and baskets of cakes to the god as offerings with prayers, and later these offerings were divided into fragments and distributed among the people. The public dance was preceded by secret rites, but we have only fragmentary references regarding the nature of these rites. Benzoni records that the idol was decorated before the arrival of the procession and there are several references to the sprinkling of the same with prayer meal as occurs in all Hopi ceremonial rites, and mention is likewise made of ceremonial purification as a preparation for the rites.

We have very fragmentary historical accounts of the shape of the idol of the Earth Mother, and the figures given by Charlevoix and Picard represent a head composed of five different animals with that of the deer in the center. As old Peter Martyr says that the Haytians have several names for an idol in the form of a woman, one of which is earth and the other mother, I have ventured to translate her name Earth Mother, and identify the ceremony as one for growth of crops.

Time does not permit me to describe in detail this ceremony or to outline the reasoning which has led me to interpret it as a festival of the goddess of growth, but there is no doubt that the rites and the dance before the image of the goddess of

the earth have for their object the growth of vegetation and increase of the crops upon which the Haytian relied for food.

Judging from the general life of primitive man we are forced to the conclusion that probably the majority of all the Antillean dances mentioned by the early Spanish writers were of a religious nature. As is most universal in primitive ritual rhythm played in them a most important rôle, and they were accompanied by a rude drum made of a log of wood or by a rasping of a stick over an elongated gourd-incised with parallel lines. This latter instrument may be of African parentage, but it is still represented in Porto Rican folk music and sold to visitors as characteristic of the island.

The poetic beauty of the songs recounting the deeds of their ancestors in their areitos did not escape the attention of some of the chroniclers. We are tempted to recognize in the Boriquen, a national anthem of the Porto Ricans, some strains of melody which may have survived from aboriginal times, and the weird music which one hears from the palm-covered house of the mountaineer may yet be found to contain Carib survivals. We know that by royal edict of Ferdinand in 1513 the right of holding their areitos or ceremonial dances was allowed to the enslaved Indians, and perhaps there may yet survive in the cabins of the lowly at least some of the melody of prehistoric Porto Rico.

Whether there were special plazas set apart for these dances is a question of some interest, and in this connection may be mentioned certain level places surrounded by lines of stones set on edge found in several localities in the island. These enclosures are ordinarily supposed to have been constructed for the game of ball, called *bato*, and are circular or rectangular in shape. Some of these structures can still be seen in the mountainous districts near Utuado, and the sources of the Bayamon

River, but the majority have been destroyed, the flat bounding stones having been used for pavements or other purposes. It is conjectured that the rows of stones which form the periphery of these enclosures are the remains of seats for spectators, the judges or cacique occupying seats in the middle, as Oviedo describes. While ball games may have taken place in them, it seems to me highly probable from their mode of construction, situation, and other characters that they were also used as dance courts, in which were celebrated some of the solemn religious ceremonies of the clans.

From this imperfect sketch, and much more of a like import—which will be developed later in a more extended account of Antillean archeology—certain general conclusions have been drawn which have a relation to the early migrations of man on the American continent. The peopling of the Antilles is believed to have occurred at a comparatively modern date and to have been brought about by off-shoots of the Arawak stock migrating in old times from South America to Boriquen *via* the chain of islands forming the Lesser Antilles.

The peculiar culture of this race attained its highest development in Hayti and Porto Rico, where conditions were most favorable to its growth. Cuba and the Bahamas had likewise been peopled by the same race, but in neither of these islands was the culture the same as in the islands mentioned. The Lesser Antilles, exposed to inroads from savage South American tribes of the same stock as those of Porto Rico, were unable, from physical and agricultural conditions, to preserve the sedentary culture of the more central islands. They were practically the starting points of the foraging parties which constantly attacked Boriquen.

The cradle of the prehistoric Antillean culture was on the banks of the Orinoco and its tributaries in the great republic of Venezuela. His ancestors belonged to the Arawak stock of South America. His culture having naturally developed certain distinctive features in fluvial waters, among great forests, became maritime, and spread from island to island until it came to Boriquen. There a part of the race became sedentary, but with the adoption of this kind of life lost much of its early prowess and daring, retaining only certain linguistic and other kinship with South American relatives.

In the same way the Caribs, another race related in some respects but distinct in others, swarmed out of the same Orinoco valley, coasted from island to island in the wake of its predecessor, and extended its excursions to Florida and our Southern States. This race also yielded to the insular environment, and, commingling its blood with that of the former, developed the composite culture we have called Antillean. These two peoples, and others of like kin, at first tribally distinct, though members of the same great stock by admixture and changed by environment, were fast coming to be homogeneous and thoroughly amalgamated when the advent of the European practically exterminated the Boriqueños and reduced the insular Carib to a wretched remnant of one of the finest native races of America.

Imperfect as is the data now available or possible to determine the nature of the prehistoric Porto Rico I will remind you that the problem of primitive culture is that of all the Antilles, and that we are on the threshold of a great subject, for, judging from collections of antiquities from the neighboring islands, I have no hesitation in saying that a vast amount

of new material awaits the advent of the archeologist and ethnologist in these islands.

It is reported that the terrible volcanic eruptions on the island of St. Vincent have blotted out the last remnant of the Caribs, but while local settlements may have been destroyed, the race is not yet extinct on the Lesser Antilles, and is well represented at various points in South and Central America, survivors offering many and instructive results awaiting our investigation. There remain also the kindred people in Guiana and Brazil, to a knowledge of whose life and customs Im Thurm, Ehr-enrech and von den Steinen have added so much, and the relatives of the Caribs and Arawak scattered among the numberless tribes of the Oronoco valley, the *terra incognita* of American ethnology.

It is from a view of this kind over a special field that we get some idea of what there is for the anthropologist to do in the future, and the new problems awaiting solution. I have called your attention to only one of many in the science of man. There are more of equal or greater importance awaiting solution, which of late years especially claim the attention and study of American anthropologists. The unknown anthropological material opened to us by territorial growth is vast, and it is natural that when our anthropologists survey this great unknown awaiting research they should be serenely conscious of the future of our science. We have indeed every reason to be proud of the past achievements of American anthropology, in which this section has played a most creditable part, but the work before us is destined to yield still greater results, shedding a still brighter luster on American science.

J. WALTER FEWKES.

#### *REMARKS OF THE RETIRING PRESIDENT AND OF THE PRESIDENT-ELECT.\**

In introducing the president of the Association, Dr. Minot, the retiring president said:

My duty is very brief. I come here as the retiring officer of the Association to have, as the last act of my administration, the pleasant duty of handing over the responsibilities to one whom we all hold in the highest respect; one who stands for a very lofty ideal of scientific research; one who has attained, what many scientific men fail to attain, a reputation which extends far beyond the realms of science, practically speaking, for to him was accorded the privilege of discovering one of those features of the heavens which appeal to the imagination, the satellites of Mars. To the popular mind perhaps this great discovery stands as the most prominent service of my successor. I speak, not for myself, but as the mouthpiece of competent astronomers who have told me that this discovery, great as it is, represents only a small part, and not perhaps the greatest part, of the services which Professor Hall has rendered to astronomical science. This Association is indebted to him personally for many years of faithful service, of great helpfulness, and I esteem it the greatest possible honor that after having been myself president of this Association, I should have the pleasure of turning over the duties of the office to Professor Hall.

In replying to the speeches of Dr. Holland and other representatives of the local committee, President Hall said:

The American Association for the Advancement of Science comes to hold its summer meeting in your city. It is fortunate for us to meet in the city of Pittsburgh, famous for its wonderful production of iron and steel, materials which lie

\* Reports received too late for insertion in the last issue of SCIENCE.